URINARY LEVELS OF ARSENIC, LEAD AND MERCURY AMONG CHILDREN AND NEUROBEHAVIOURAL TOXICITY: AN EXPLORATORY STUDY

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Background: Diet and living near to chemical/metal industries are a potential source of environmental exposure to metals such as lead, mercury and arsenic, which are recognized causes of neurological disorders in children. Our objective was to explore the relationship between urinary levels of arsenic, lead and mercury, and neurobehavioral performance (subclinical effect) in children aged 9-11.
Methods: Spot urine samples were obtained from 79 children recruited from cities representative of five different environmental scenarios in Andalusia (Spain): 14 from urban/residential, 34 from urban/industrialized, 7 from mining, 14 from rural, and 10 from rural/industrialized. Neurobehavioral performance was satisfactorily assessed in 37 boys and 36 girls by the Behavioral Assessment and Research System (BARS) using Spanish instructions. Multielemental ICP-MS was used to quantify urinary levels of arsenic, lead and mercury. General linear models were used including age, gender, social class, global physical activity, and shore fish consumption as covariates, plus the exposure variable (log transformed urinary levels of each metal separately) to predict each of 14 neurobehavioral outcome variables.
Results: Higher levels of mercury were associated with a worse performance of the Alternate Hand Finger Tapping (AHFT) test (measures "coordination") (p=0.03), of the Digit Span Forward test (measuring "attention") (p=0.08) and of the Errors on Simple Reaction test (measures "response speed") (p=0.02); and with better performance of the Continuous Performance Hit Latency test (measures "attention") (p=0.001). Children with higher arsenic levels scored better on the Continuous Performance False Alarm Latency test (p=0.08), and tended to score worse on the AHFT test (p=0.10). No statistically significant associations were observed for urinary lead, although children with higher levels tended to perform better with the AHFT test (p=0.09), and worse with the Continuous Performance Correct Rejections test (p=0.15).
Conclusions: Our results suggest that urinary levels of mercury are related with poorer neurobehavioral performance among children.